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Article

Investigating Ethos and Pathos in Scientific Truth Claims in Public Discourse

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Abstract
The article seeks to explore the role played by the rhetorical modes of ethos and pathos when scientific knowledge is constructed in public discourse. A case study is presented on the public debate in Germany on possible risks to bees from neonicotinoid pesticides, focusing especially on a detailed analysis of scientific knowledge claims found in texts produced by two lobbying groups involved. The findings indicate distinctive rhetorical patterns in the context of scientific truth claims realising, for example, appeals to concern and the display of scientific competence and integrity.

Keywords
ethos; linguistics; pathos; public discourse; rhetoric; scientific knowledge; truth claims

Issue
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1. Introduction: Scientific Knowledge and Public Discourse

The linguistic understanding of scientific knowledge in the public sphere has changed significantly in recent years. Since the late 1990s, the relationship between scientific knowledge and the public sphere has been viewed primarily from the point of view of transfer, with knowledge first being generated within the scientific community and then being transferred to the public. This process has been described variously as transfer (Wichter & Antos, 2001), popularization (Niederhauser, 1998), and—more critically—transformation (Liebert, 2002).

For a number of reasons, the idea of unidirectional transmission no longer seems appropriate today. For one thing, the direction of knowledge transfer has been reversed in the context of citizen science. Formats of citizen participation play an increasingly important role in the public perception of science (Hecker et al., 2018). In addition, greater attention is being paid to cases in which scientific knowledge and its validity are negotiated in public discourses. Well-known examples of this include debates about climate change, vaccination, nutrition, and health, some of which have already become the subject of discourse-linguistic studies (Janich & Simmerling, 2013; Tereick, 2016). Scientific knowledge is no longer asserted by scientific experts alone and 'translated' by journalists. Politicians, lobbying groups, NGOs, and ordinary citizens also present knowledge claims in public discourses and thus participate in the co-construction of scientific knowledge in the public sphere.

Scientific knowledge, uncertainties, and technologies are often debated in the context of public debates and controversies regarding policy decisions and processes, and emotionality often plays a significant role in such debates (Gottweis, 2007). It seems clear, then, that affect is intrinsic to scientific knowledge claims in such contexts, and that it plays a key part in the linguistic form they take and in the credibility of their suggested validity. In this essay, I want to demonstrate how this connection between scientific knowledge and emotion in public discourse can be described from a rhetorical perspective. To this end, I first explain the relevance of an integrative approach that draws on rhetoric and linguistics. I then dis-

cuss how the two classical categories of ethos and pathos can be rendered useful for linguistic analysis. Finally, I use an analysis of the German public discourse on neonicotinoids to demonstrate the role ethos and pathos can play in the rhetorical strategies used by actors in the course of constructing knowledge.

2. A Rhetorical Perspective on Scientific Truth Claims

The rhetorical perspective adopted in this essay developed out of the critical engagement of discourse linguistics with scientific knowledge. However, the understanding on which it is based corresponds largely to the approaches found in the rhetoric of science. This "small but proud scholarly field" (Depew & Lyne, 2013, p. 1) has its origins in literary studies and philosophy and focuses on formal as well as heuristic aspects of scientific language use (Fuller, 1995; Gross, 1990).

2.1. Scientific Truth Claims as a Characteristic of Scientific Knowledge

The phenomenon of knowledge is addressed in discourse linguistics by examining the utterances that constitute this knowledge and their formation in discourse (Warnke, 2015). Thus, to explore the essential characteristics of scientific knowledge is to explore the essential characteristics of a certain formation of utterances. Discourse linguistics draws on the findings of the sociology of knowledge and the philosophy of science, where scientific knowledge is also regarded as co-constructed (Knoblauch, 2008). In addition, it is characterised by a systemic conciseness (Hoyningen-Huene, 2013) and, in systems theoretical terms, by an attentiveness to the negotiation of truth (Luhmann, 1990). If we apply these insights to discourse linguistic reflections on the constitution of knowledge (Warnke, 2009), it becomes apparent that the negotiation of scientific truth claims can be regarded as the central characteristic and constituting principle of scientific knowledge.

It seems appropriate at this point to introduce a careful conceptual distinction regarding the English word 'claim': On the one hand, 'claim' refers to a type of utterance which, in principle, corresponds to the illocutionary class of the representative or assertive speech acts (Searle, 1976). This class includes assertions as well as descriptions, explanations, and even rhetorical questions. Such utterances can be said to constitute scientific knowledge. Following Stocking and Holstein (1993), I will call segments of texts representing utterances of this kind 'scientific knowledge claims.'

On the other hand, utterances of this type simultaneously imply abstract claims to validity. More specifically, in the case of scientific knowledge claims, the claim to validity is that of scientific truth. The notion that there are specific types of validity claim stems from Jürgen Habermas and has been adopted as a means of characterizing different types of argumentation: Epistemic argumentation makes and contests truth claims, normative argumentation is concerned with claims to rightness, and aesthetic argumentation is concerned with claims to beauty (Eggs, 2000). I will therefore call the abstract principle of validity made and contested in texts of the kind described above 'scientific truth claims.'

Bearing this distinction in mind, it becomes clear that the discourse linguistic analysis of scientific knowledge is concerned mainly with how actors in specific discourse contexts produce scientific knowledge claims that assert or contest the scientific truth claim of a statement before other discourse participants. Such communication specifically oriented towards validity claims can be referred to as persuasion, which is central to rhetoric. Hence, this is the point at which the perspective adopted from discourse linguistics becomes a rhetorical perspective aligned with that of the rhetoric of science (Janich & Kalwa, 2018).

2.2. A Rhetorical View on Scientific Truth Claims in Public Discourse

The role of rhetoric in discourse linguistic analysis becomes even more evident when looking at a public discourse context where scientific truth is to be established by various actors as a means to pursue political aims; this is the case in the study presented in this article. Scientific knowledge in these contexts can only be properly described when understood as embedded purposefully in a broader rhetorical context and situated within a specific constellation of actors, institutions, values, beliefs, and interests. Hence, adopting a rhetorical approach to scientific knowledge in this article means looking closely at the specific form of scientific knowledge claims in a specific discourse situation, the aim being to examine precisely how these claims are rendered plausible.

From its very beginnings in Aristotelian times, classic rhetorical theory has defined three main sources of plausibility for claims. In addition to logos, rational argumentation, there is ethos, "the credibility of a speaker as a social construction," and pathos, "the ability to connect to the affective dimension of the situation for the audience" (Lyne, 1995, p. 255). Perhaps as old as this distinction is the scepticism with which scientists have looked upon personal values and emotions when it comes to scientific truth (Nate, 2009). Despite this scepticism, I will argue that both ethos and pathos play a vital role when scientific knowledge is not transferred but constructed in public discourse. Rhetorical analysis can shed light on the role emotions play when scientific truth claims are asserted, as will be demonstrated in the case study presented below.

3. Ethos and Pathos as Descriptive Categories for Linguistic Analysis

Ethos and pathos are intuitively insightful categories well established in the tradition of rhetoric. In the following,

an attempt will be made to operationalise the two categories for linguistic analysis by linking the classical understanding with contemporary considerations and strands of research.

3.1. Ethos: Language and the Presentation of Self

The validity of a claim depends on the credibility attributed to a speaker. In the classical theory of rhetoric, this kind of credibility is understood as something an orator does not simply possess but rather expresses through his or her speech (Knape, 2013). This rhetorical mode is called ethos and is often translated as self-presentation. However, as Plantin (2006) points out, the category of ethos includes a range of heterogeneous elements such as reputation, aura, and charisma. Aristotle defined ethos as being composed of ability, virtue, and benevolence. In fact, contemporary credibility research in psychology has confirmed expertise, integrity, and benevolence as distinct dimensions of trustworthiness (Hendriks, Kienhues, & Bromme, 2015). However, aspects of trustworthiness describe the perceptual categories of recipients and do not refer directly to linguistic categories (Roth, 2004).

Much of the linguistics literature on self-presentation comes from conversation analysis and refers to Erving Goffman's theory of impression management and Penelope Brown and Steven S. Levinson's face theory (Schwitalla, 1996; Spiegel & Spranz-Fogasy, 1999). Rhein (2015) offers a linguistic study on the self-portrayal of scientists in public debates along these lines. Although Knape (2013) notes that interactional concepts such as image and face can also be addressed within the framework of the Aristotelian concept of ethos, they do not seem useful for a text-based discourse analysis. One can state generally that self-portrayal can be examined on the basis of the statements made and, in particular, that it encompasses characteristics identifiable from linguistic action (Schwitalla, 1996). However, Rhein (2015, p. 71) remarks that in principle all linguistic possibilities—from prosody to lexis and from the selection of speech acts to the overall style of communication—can be used as means for self-portrayal.

With regard to the demonstration of expertise, linguistics research has identified some typical features that serve this intention (Antos, 1995). However, the practices mentioned in this context refer primarily to scientists as orators and can be transferred to public discourse to only a limited extent. Many authors cite technical scientific language as probably the most significant means of demonstrating expertise (Antos, 1995; Janich, 2012). Other relevant features of scientific texts might include numbers, graphs and tables, scientific style, and speech patterns such as explanation and complex argumentation (Czicza & Hennig, 2011). When it comes to scientific integrity and benevolence, however, there are no clearly identifiable characteristics. One aim of the case study presented below, therefore, is to develop these categories inductively for linguistic description by identifying relevant linguistic phenomena. The results are discussed in Section 5.

3.2. Pathos: Language and Emotion

Pathos is understood classically as the appeal to emotion. It was regarded by many of the ancient rhetors as the most powerful mode of persuasion. For Aristotle, the purpose of pathos was to evoke certain emotional states in the audience in order to achieve or support rhetorically persuasive effects (Aristoteles, 2007). This appears to be in keeping with modern psychological insights that affirm the effect of specific emotions on a person's judgement (Angie, Connelly, Waples, & Kligyte, 2011). Nevertheless, ancient definitions of pathos are not homogenous and do not include distinct categories for linguistic analysis (Fuhrmann, 1990). For the present analysis, the findings of linguistics research on language and emotion first had to be set in relation to the classical category of pathos, in the course of which fundamental semiotic and pragmatic insights also had to be considered.

For this purpose, it may be helpful to bear in mind the Saussurean distinction between language use as utterance (*parole*) and the language system (*langue*). Utterances are believed either to express a speaker's emotions or to evoke emotions in a listener. Luppold (2015) calls this the emotional and the emotive function of an utterance. This addresses two of the three basic communicative functions of language in the organon model put forward by Bühler (1999). Continuing along these lines, it might also be possible to represent discourse objects in emotional terms. Polo, Plantin, Lund, and Niccolai (2017) call this function "emotional schematization," while Luppold (2015) uses the term "emotional perspectivization." This kind of emotional representation is possible due to the fact that language systems do in a certain sense contain emotions (Kalwa & Römer, 2016). Herrmanns (1995) mentions affective adjectives as examples. In addition, cognitive semantic theories such as frame semantics take emotions to be essential components of our conceptual system and thus also to be components of certain semantic frames which are parts of a given language system (Ruppenhofer, 2018). The linguistic term 'semantic frame' refers to lexical meaning as a concept with its own internal structure, based on our general knowledge of the world and evoked in language use (Ziem, 2008). When a semantic frame is evoked in the course of communication, it can lead to an emotional representation of discourse objects. Rhetorical pathos can be described more specifically in linguistic terms thus:

- Expression of emotion (emotional function): Usually through non-verbal and para-verbal phenomena such as facial expression or tone used by a speaker as well as certain discourse particles such as 'unfortunately' (Herrmanns, 1995). Certain ex-

pressive speech acts (as described in speech act theory) and explicit statements can also serve this function;
- Emotion-related representation (emotional perspectivisation): This can be the lexical representation of a certain emotion explicitly attributed to a discourse object. In addition, emotions can be implicated in a text: discourse objects can become emotionally perspectivised through linguistic representation on the semantic level. One way to describe this is to analyse semantic frames with regard to emotion. This dimension of pathos will be illustrated further in the case study below;
- Evocation of emotion (emotive function): This appears to be the ultimate aim of rhetorical pathos following Aristotle's classical definition. Still there is no clear way to identify a strict set of linguistic phenomena that specifically serve the function of evoking a certain emotion in an addressee. I will argue here that to describe the emotive function of a text, it is necessary first to examine closely the expression and representation of emotion, since emotions evoked in an addressee are often either mirrored or complementary emotions to the ones expressed by a speaker (Luppold, 2015).

As will be demonstrated in Section 6, it is helpful for linguistic analysis to differentiate between the three functional dimensions of rhetorical pathos.

4. Ethos, Pathos, and Scientific Knowledge in Public Discourse: A Case Study

The findings presented in the following derive from an ongoing linguistics research project focusing on scientific knowledge and uncertainty in public discourses. They thus constitute just one part of a more comprehensive research context. The project investigates how groups of actors in a public discourse space, described by Böschen (2015) as "Gestaltungsöffentlichkeit" (decision-making public), constitute scientific knowledge and uncertainty. The object of investigation is the discourse conducted in Germany on the use of a class of pesticides known as neonicotinoids and their possible risks in relation to bees. In particular, the project seeks to explore the rhetorical strategies used by lobby groups seeking to constitute scientific knowledge in the discourse.

4.1. Discourse Segment

The discourse segment investigated in the project can be limited in time between January 2013 and April 2018. The public debate about a ban on neonicotinoids broke out after the publication of a report by the European Food Safety Authority in January 2013, which identified data gaps and possible risks to bees of neonicotinoid use. As a result, the European Commission initially imposed a two-year moratorium, after which a reassessment would provide clarity. This re-evaluation followed in spring 2018 and largely confirmed the previous findings. As a result, the use of neonicotinoids in agriculture was banned throughout the EU. In the time interval between the two evaluations and at the time of the political decisions, a number of different actors intervened in the discourse and participated in the co-construction of the scientific knowledge about neonicotinoid use. In addition to some beekeepers, scientists, and politicians, those who participated actively in the discourse included corporations and interest groups from the agricultural industry (especially neonicotinoid producers Bayer and Syngenta, the lobby association IVA, and the German farmers' association DBV), as well as environmental protection organizations (especially Greenpeace, NABU, and BUND/Friends of the Earth Germany). Both groups of actors showed a particularly high level of commitment to pressing home their perspective on the state of research in the discourse space.

4.2. Text Corpus and Method of Analysis

The analysis presented in Section 5 is based on a corpus of texts from the discourse segment described above, which focuses on the agricultural industry and the environmental organizations as the two main groups of actors. With regard to rhetorical analysis, both groups of actors can also be called the respective orators of the texts. Both groups are involved intensively in the constitution of knowledge, and each group pursues opposing goals. In order to determine which rhetorical strategies are used, texts are examined with which the actors seek to establish scientific knowledge as valid in the public discourse space. For this purpose, both groups make use of two types of texts. The first type includes press releases written in response to current events, such as new publications and political decisions, and whose aim is to influence the public. The second type includes information brochures that are available for download on the websites of the actors and whose primary aim is to convince political decision-makers, stakeholders, and interested citizens of their own position or to provide them with arguments.

The text corpus was generated by first establishing an overview of the relevant discourse actors. Following this, texts were sought on these actors' websites that could be assigned to the discourse. Keywords in favour of an assignment were 'neonicotinoids,' 'imidacloprid,' 'thiamethoxam,' 'clothianidin,' 'thiacloprid,' and 'bees,' as well as related composite words. Texts containing the keyword 'pesticides' were also checked. The resulting text corpus contained 85 press releases (54 by environmental organizations and 31 by agricultural industry) and 6 brochures (3 by each orator). Since in previous phases of the project text analyses of 6 further brochures had already been carried out without annotation support, it was also possible to fall back on existing findings for a more informative interpretation of the results.

To investigate ethos and pathos in the context of scientific truth claims the following procedure was chosen: Theoretical considerations as described above formed the basis for an analysis of the corpus, which was carried out using the annotation software MAXQDA. Due to the size of the corpus and its segmentation on different linguistic levels (such as word or clause level), quantitative analysis was regarded mainly as a possible source of indications and additional back-up for in-depth qualitative-hermeneutic analysis. Accordingly, in this essay the focus is not on quantitative evaluation but on qualitative rhetorical analysis. The findings presented here can be regarded as prototypical and as representing different possibilities of discursive strategies. All text examples presented were translated from German into English by the author. The source is indicated by abbreviations, which can be found in the corpus list included in the Supplementary Material.

Thus, the overall analysis had two objectives: One was to develop relevant categories for a linguistic description of ethos and pathos. Another was to find out how ethos and pathos function in the negotiation of scientific truth claims. In the following, the findings for both groups of actors will be presented, contrasted, and linked. An overall comparison of the two strategies is then expected to generate helpful insights.

5. Ethos in Scientific Truth Claims

During the annotation phase of the analysis it became apparent that the dimensions derived from psychological research are problematic for linguistic description. One problem that emerged was how to make the category of scientific integrity tangible. According to Hendriks et al. (2015), scientific integrity means following scientific norms and values. Thus, quoting and referencing was regarded as a corresponding self-representation procedure. If, however, one considers the public addressing of the texts, these practices can just as easily be interpreted as a demonstration of expertise. For this reason, scientific competence and scientific integrity were combined into one single category for annotation.

The dimension of benevolence likewise did not appear to be straightforward. Benevolence relates to the orator's "orientation toward others or society, for example, her or his sense of responsibility and morality. This factor represents participants' impressions regarding whether the scientist acts with the interests of others at heart and not just personal aims or benefit" (Hendriks et al., 2015, p. 16). In the context of the description of a scientific ethos, it seemed important here that the actions addressed should refer to knowledge claims and not to political demands. Text passages in which the orators talked about their commitment to research and their motivation for carrying out scientific work thus appeared relevant to benevolence. When addressing an audience of lay people, positive intentions toward the audience can also be shown by demonstrating so-called transfer qualities in using techniques to transfer knowledge from experts to laymen, such as explaining terminology and research processes (Niederhauser, 1998).

Another difficulty was that certain phenomena could not be readily recorded by means of annotation using MAXQDA, even though they appeared to be relevant. This particularly affected the layout and graphic design of the brochures as well as the overall style of the texts. A list of the subcategories derived inductively can be found in the Supplementary Material. The quantitative findings should not be overestimated, especially as annotations were made on different linguistic units. The 'scientific language' label, for example, was used primarily to annotate individual lexemes and multiword units such as 'exposition' or 'sublethal effects,' while speech act patterns and practices such as 'presenting study results' refer to larger text segments. In the following, therefore, observations from the qualitative analysis will be addressed first and foremost.

5.1. Ethos in the Environmental Organizations' Texts

With regard to the environmental organizations' texts, a certain division can be identified in relation to their respective ethos. The demonstration of scientific expertise can be found above all in more elaborate brochures, while press releases in particular show a less scientific self-portrayal. In general, the amount of scientific ethos demonstrated by environmental organizations appears relative to specific (parts of) texts. Texts addressing a broader public demonstrate little scientific competence and integrity, while texts addressing a more interested or more expert audience reveal a more dense and complex scientific ethos when presenting scientific knowledge claims. At the same time, however, they tend to lack transfer qualities.

The textual structure of the report "Bye bye Biene?" (Greenpeace, 2013a) can be used to illustrate this. Here, the main part of the text (33 pages), which provides a detailed overview of the state of knowledge on agricultural risks to honeybees, is preceded by a ten-page summary of the research results and their implications. Both parts of the text reveal the same argumentative structure. However, they differ not only in length but also in the scientific ethos demonstrated in each: In the summary part, scientific knowledge claims are largely presented with little use of scientific language, complex argumentation, or scientific apparatus (quotations, references), with the exception of a rather complicated table. However, the table itself is well designed and presented in colour. Thus, the summary part of the text demonstrates benevolence by using techniques of popularization. The main text, however, shows a shift in complexity and style. Knowledge claims are developed here using scientific terminology and citation. Also, while knowledge claims in the summary part are presented mainly in the indicative voice, instances of hedging and caveats can be found in the main part.

5.2. Ethos in the Agricultural Industry's Texts

In contrast to the environmental organizations' texts, agricultural industry texts seem to be more concerned with demonstrating scientific ethos. A fairly coherent pattern emerges throughout the discourse. The agricultural industry orators seem to be consistently interested in demonstrating scientific competence. This can be seen predominantly in the frequent use of scientific language such as technical terminology, symbols, and numbers. The validity of knowledge claims is usually supported by a more complex form of argumentation. This pattern can be found both in the more elaborate brochures and in a large number of press releases. Also, a demonstration of scientific integrity appears relevant for the scientific ethos of the agricultural industry. This is particularly evident in the citations and references within the texts and in the lists of sources at the end of the texts. Interestingly, this too applies not only to brochures but also to some press releases. In this context, it is noticeable that scientific norms and principles of scientific practice are at times stated explicitly. An emphasis on scientific values is also to be found in the naming of a large number of expert authorities who are quoted. In addition to highlighting their competence, the presentation of these authorities often emphasises their independence and their commitment to science as opposed to espousing any political goals.

The texts of the agricultural industry also show that the orator is well-disposed towards the reader. As noted above, scientific competence is realised in complex argumentation and by technical terms. The linguistic style, however, remains easy to understand. Particularly in the information sheets, scientific knowledge practices are explained in detail. This applies not only to the conduct of field research, which is also illustrated by images, but also to internal processes of scientific debate. In particular, the elaborate and well-designed information brochures, whose meaning and function it corresponds to, are characterised by a high effort to transfer knowledge.

6. Pathos in Scientific Truth Claims

Annotation for pathos was carried out using two main categories, derived deductively from the theoretical considerations described above, with subcodes in the categories being elaborated inductively during the process of annotation. The two main categories were linguistic units of emotional expression and emotion-related representation, which in turn was differentiated according to emotion vocabulary and emotion-related semantic frames.

Segments found to explicitly express emotion by the orator were identified using emotion vocabulary as indicators. The segments identified were labelled with respect to the specific emotion, which in those cases could be distinguished by lexical clues. In (1), the expression of an emotion becomes apparent through explicit naming and the use of a possessive pronoun in a self-statement:

> (1) Our handling of this specific case ultimately reflects *our general concern* about the European Commission's approach to regulating agricultural technologies. (Syngenta, 2018)

Two sub-categories emerged for emotion-related representation: explicit attribution via emotion vocabulary and implicit perspectivization through semantic frames. Explicit attributions were annotated with respect to specific emotions, in analogy to explicit self-statements. However, implicit perspectivization proved to be more problematic with respect to specific emotions. Hence, segments of texts were annotated with respect to semantic frames. To achieve the clearest possible annotation, only lexemes were annotated which, according to their lexical form, could be regarded as clear representatives of a semantic frame:

> (2) The study identifies seven pesticides that are *dangerous* to bees, three of which belong to the controversial neonicotinoid class of *highly poisonous neurotoxins*. (Greenpeace, 2013d)

In (2), the semantic frames DANGER and POISON can be identified clearly due to lexical information provided by lexemes which can then be annotated accordingly. A table with the relevant semantic frames and their distribution in the discourse can be found in the Supplementary Material. It should be noted, however, that the identification of the corresponding frames already represents a significant interpretive achievement of the analyst, which can hardly be separated from the qualitative analysis of the texts in the analytic process.

During the annotation process a number of relevant linguistic phenomena were identified. However, it also became clear that a detailed analysis of individual texts and text passages is essential for an understanding of pathos. Hence, in the following the concrete strategies of the orators will be examined by means of a qualitative analysis of individual examples.

6.1. Pathos in the Environmental Organizations' Texts: A Cause for Concern

At the centre of environmental organizations' pathos strategy is the emotion of concern. This can be seen on the level of emotional expression and it can also be deduced from the use of semantic frames for emotional perspectivization. In order to understand both, it is helpful to first see how the knowledge claims are generally integrated into the textual structure. A basic textual pattern can be identified for the discourse position that has the following syntagmatic structure: 'Bees are important helpers of humans. But bees are dying. One possible cause of bee mortality is neonicotinoids.

Researchers found out that neonicotinoids harm bees. Neonicotinoids should therefore be banned.' Within this pattern, concern can be expressed explicitly. It is typical for environmental organizations that the emotional expression in press releases is made by persons who can be regarded as representatives of their position in the discourse, such as members of the Board or responsible experts, as in (3):

> (3) Christiane Huxdorff is an agricultural expert at Greenpeace Germany and *is concerned* about the outcome of the EFSA study. (Greenpeace, 2014)

Furthermore, the main objects of discourse—neonicotinoids and bees—and their relationship are emotionally perspectivised within this pattern by expressing the underlying concept of causation using lexemes that realize emotion-related semantic frames such as DANGER, POISON, and KILL. The following examples may serve to illustrate this point:

> (4) Pesticides, especially Syngenta's thiamethoxam, *kill* bees. (Greenpeace, 2013e)

> (5) Bees *threatened* by pesticides. (Greenpeace, 2013d)

> (6) The *toxic effect* of neonicotinoids on bees is clearly proven. (Greenpeace, 2013c)

> (7) It is a fact that the neonicotinoids contained in pesticides are strongly suspected to be *responsible* for the worldwide bee *mortality*. (BUND, 2015)

In the semantic structure of (4), neonicotinoids are represented through processes of metonymy and personalization as a semantic agent affecting bees realised as semantic patient. A similar semantic structure can be observed in (5) with respect to the causation of DANGER. (6) shows less indication of agency and therefore responsibility but still represents an instance of perspectivised causation. In (7), causation between neonicotinoids and bees is represented using the concepts of GUILT and DEATH. The semantic frames identified can be related more specifically to emotion regarding this semantic structure and relating it to the model of Ortony, Clore, and Collins (1988). Here, emotions are understood as valenced reactions to events, agents, and objects. As the semantic frames represent a causal event and an inherent evaluation of its elements, one might justifiably deduce emotions such as pity, reproach, or indignation as related to the perspectivization. Another emotion that might ultimately result is concern.

This perspectivization pervades the entire discourse and thus also has an effect on scientific knowledge claims. This becomes especially apparent when scientific findings regarding the effects of neonicotinoids on bees are reported, as can be seen from the following examples:

> (8) These *neurotoxins*, which are particularly *dangerous* for bees, are used to dress the seeds and, according to toxicologists, are 6,000 to 7,000 times more *toxic* than DDT. Studies have shown that neonicotinoids in bees and birds can lead to restrictions in orientation and disturbances of the immune system. In addition, these pesticides *kill* many insect species that were used by birds as food. (BUND, 2013)

> (9) One of the causes of bee mortality is neonicotinoids. These are nerve *toxins* that are commonly found in crop protection products….Scientists from France and the UK discovered that neonicotinoids…confuse bees and decimate bumblebees. (Greenpeace, 2013b)

In (8), the linguistic appearance of the scientific knowledge claim in sentence two itself is more oriented towards a technical style. The sentences immediately preceding and following this one, on the other hand, clearly show the semantic frames POISON, DANGER, and KILL, which results in an emotional perspectivization of the larger text segment. In (9), the scientific discovery introduced in the subsidiary sentence represents a semantic structure with neonicotinoids as agent and bees as patient of causation which is coherent with the emotional perspectivization pattern described above and is indicated through the POISON frame in the preceding paragraph.

The interpretation that this perspectivization is connected with concern is supported by the fact that some text passages attribute scientific findings explicitly to the corresponding emotion, as the following example shows:

> (10) The data available for other pollinators paint a similarly *worrying* picture. (Greenpeace, 2017)

Here scientific findings are explicitly framed as discomforting and as a cause for concern. In a metonymic fashion, data is even presented as alarming, attributing to science itself an expressive quality. The findings suggest that the scientific knowledge claims in the environmental organizations' strategy do have a pathos component. Its role for the plausibility and functionality of the inherent truth claims will be discussed further in Section 7.

6.2. Pathos in the Agricultural Industry's Texts: A Need for Scientific Sobriety

Analysing the agricultural industry's texts, a different pathos strategy can be observed. Even though concern is sometimes expressed as in (1), it relates mainly to political decisions and their economic consequences. If at all, concerns about a causal link between neonicotinoids and bees are presented as a discursive phenomenon, as in (11):

> (11) Some years ago, *concerns were expressed* that neonicotinoid residues in guttation droplets secreted

by plants from treated seeds could *poison* bees. (Bayer Bee Care Center, 2016)

Concern is conceptualised here as the content of an utterance, which through use of the passive is not assigned to a speaker. In addition, the semantic frame POISON is relativised by the mode of the subjunctive and is put at a certain textual distance to neonicotinoid due to the complex syntactic structure of the nominal phrase. The entire nominal phrase, which realizes the semantic agent of poisoning, also contains an intensive use of specialised terminology. This already points to the major pathos pattern of agricultural industry: Emotion is explicitly presented as an undesired quality of the ongoing debate, one which results in demands for scientific sobriety, as in (12):

(12) Especially in a charged debate on issues such as biodiversity, bee health and the use of neonicotinoids, it should be the role of research to investigate the problems with scientific sobriety, demands the IVA. (IVA, 2016b)

While analysing the texts of agricultural industry, no emotional perspectivization comparable to that of environmental organizations could be identified. This might indeed be interpreted as an expression of sobriety. Also, it might coincide with the frequency of technical language noted above which seems to be used partly as a means of de-emotionalization, as illustrated by (13):

(13) Risk is defined as potential danger (toxicity) x exposition. (Bayer Bee Care Center, 2018)

Here the focus on the term 'risk' serves as a counter to the ecologists' focus on the term 'danger.' While both danger and risk have highly emotional connotations in colloquial contexts, risk is also used in scientific contexts. As a scientific term, risk has a clearly distinct meaning. By explicitly defining risk in scientific terms, agricultural industry tries to counter the colloquial and emotionally connoted word in the discourse with the more neutral and opaque term. Agricultural industry even expressly rejects the use of terms used by environmental organizations by criticizing them as being too emotional. This concerns the German word *Gift* (poison or toxin) for neonicotinoids:

(14) For this reason, it must be assumed that the often-heard classification as a 'neurotoxin' is also done with the intention of introducing another deterring term into the discussion. (IVA, 2016a)

In (14), the accusation of emotionalization is presented in a matter-of-fact scientific tone, which can be seen, for example, in the passive construction. Scientific sobriety is thus not only explicitly demanded by the agricultural industry but is also presented as a pathos dimension of knowledge claims in order to support their validity.

7. Summary Interpretation of Results of the Analysis

A first result of the analysis was the identification of linguistically tangible categories suited to describe ethos and pathos in the discourse context. For example, the approach to emotional perspectivization proved to be revealing. However, the linguistic description of ethos along the lines of the three dimensions of trustworthiness via annotation was shown to be somewhat problematic: Even though relevant categories could be identified, interpretation in the light of the three dimensions proved to be challenging. The categories should therefore be elaborated further within the ongoing research project and expanded in other studies on other discourses. However, the analysis revealed differences between the discourse positions, which can be further interpreted.

In terms of ethos, there is a reasonable explanation for the higher investment of communicative resources on the part of agricultural industry. If the texts in the corpus are regarded as being directed at a public audience, private economic actors—especially large enterprises—are attributed relatively little trustworthiness by the broader public. The opposite holds true for NGOs, as demographic polls in Germany show (Weitze & Heckl, 2016). As a result, agro-industrial discourse actors are obliged to invest more interactional resources in order to establish credibility.

The pathos of concern in environmental organizations could be interpreted, for example, as a kind of emotional coherence between the diagnosis of bee mortality and the more specific issue of the effects of neonicotinoids on bees. If someone considers the mass dying of bees to exist and also resonates with the associated emotion of concern, while at the same time the effects of neonicotinoids on bees are framed in the context of the same emotional state, that person might also consider the reported effects as plausible. In addition, however, the overarching emotion of concern inherent in the consistent framing could help to establish or strengthen a causal link between bee mortality and the possible effects of neonicotinoids on bees.

For a comprehensive understanding of the functionality of ethos and pathos in relation to scientific truth claims, however, it is highly recommended to consider further pragmatic and discursive conditions as well as the specific goals of the orators. For example, there are indications that agricultural industry is generally more concerned with epistemic argumentation in discourse, while environmental organizations is more focused on political demands. In this context, the high investment in scientific ethos on the part of agricultural industry can also be seen as a way to focus on scientific knowledge in general. The demonstration of scientific ethos in this respect is one device embedded in a greater strategy to give presence to the process of scientific inquiry.

Against this background, the pathos strategy of environmental organizations can also be understood as a link between epistemic and normative argumentation.

The semantic frames mentioned in Section 6.1 have not only an emotional but also a normative component, also present in the corresponding lexical forms. Mitchell and Lyne (2015), for example, have classified danger as a "hinge term," with which the transition is made from the forensic to the deliberative genre and thus from epistemic to normative argumentation processes. By evoking corresponding pathos components when raising scientific truth claims, these validity claims themselves become closely interrelated with political debate. Correspondingly, the opposite is the case with agricultural industry. Since the claims to scientific validity here have seemingly no pathos component, no political actions can be derived from them. Already in the seventeenth century, philosopher David Hume argued that no one can be persuaded to action just by force of reason (Gottweis, 2007). Taking this seriously, the implication arises that by focusing on an emotionless scientific rationality, the agricultural industry 'widens the gap' between the epistemic and the normative.

As sociologists Kleinman and Suryanarayanan (2012) have shown, there is evidence to indicate that agricultural firms such as Bayer Crop Science intentionally manufacture ignorance concerning the connection between honeybee losses and systemic pesticides in the US in order to prevent political action. It therefore appears tempting to ask if the rhetorical patterns identified in this article are not ultimately means to corresponding ends. Still, the situation in the present discourse is more complicated, since ignorance regarding possible risks may very well be used as an argument for regulatory action due to the precautionary principle. This policy principle on environmental and health issues was installed at the UN Conference in Rio de Janeiro in 1992 and states that regulatory decisions do not necessarily have to be based on unambiguous evidence of damage (Freudenburg, Gramling, & Davidson, 2008). This is likely to be an important point towards which an understanding of the rhetorical strategies of both parties must be oriented. To prevent political action, contesting the truth claims of opposing discourse parties, and thereby creating ignorance and uncertainty, is not a sufficient strategy: Instead, the connection to normative considerations must be disrupted and made more indirect. The pathos of sobriety seems an adequate measure for the agricultural industry since it loosens the tie that environmental activists try to establish between scientific knowledge and political action by emphasizing concern.

However, to reinforce such a hypothesis, the findings of this article must be considered further in the context of more complex rhetorical strategies. In particular, the interdependence with argumentation patterns and relevant topoi may well prove promising. Only in this way will it be possible to draw clear implications for the epistemic quality of statements and thus the constitution of scientific knowledge and ignorance in discourse. This represents an important objective in the further course of the project.

8. Conclusion

Rhetorical analysis can shed light on the role played by affect in the construction of scientific knowledge in the public sphere. As has been shown, it can be assumed that pathos in particular might function as an essential link between knowledge claims to scientific truth and political demands. It could also be shown that scientific truth claims can thus be supported relative to global discourse strategies by various uses of emotions. In the case study, both sobriety and concern have been shown to be functional supports of scientific truth claims in public discourse.

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Conflict of Interests

The author declares no conflict of interests.

Supplementary Material

Supplementary material for this article is available online in the format provided by the authors (unedited).

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